

## **PROCEEDING OF GENERATED OF ELASTIC AND SAFETY CLUTCHES**

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**Key words:** clutches, elastic, safety, function, multiple.

**Abstract:** The paper presents typological and structural generation of elastic and safety couplings. The first part synthesizes the main characteristic function of mechanical couplings, expressed in the form of systematization criteria. On their account we suggest a matrix structure of functions similar to the table of Mendeleev, which constitutes a typological variant of mechanical coupling extended in synthesis. Thus, the known couplings are generated and others new, such as the elastic and the safety clutches. The second part, starting from the functions characteristic to the cam gears, we propose a simple method of structural generation of elastic and safety couplings. In the third part the constructive scheme, the dynamic and cinematic modulation as well as the theoretical and experimental research for the proposed variant from the new clutch type.

### **1. INTRODUCTION**

In general expression, by mechanical clutch it's understand a technical system which makes the bundle between two shafts, with relative fix and relative variable position and it ensures the unmodified transmission of the torque and of the rotation moment between the shafts; the bundle between the shafts realized by the clutch, must also ensures the power transmission in the condition of the existence of meaningful linear and/or angular deviations [1].

Starting from the general definition of the mechanical clutches and taking in consideration the constructive and functional variety of them, systematization criterions and sub-criterions can be identified and formulated.

Basis on the established criterions, the topological engendering of mechanical clutches can start. The proposed engendering modality includes all the mechanical clutches representative variants, existent in the specialty literature.

It is presented a derivation proceeding of the structural schemes which leads to the obtaining of a new clutch variant named "Elastic and safety clutch". From the critic analysis of the utilized mechanisms in techniques it results that the mechanisms with cam it's the most suitable for the modulation of the new clutch type.

Further on it is proposed a deviation proceeding of the structural schemes for obtaining different constructive variants. There were obtained twenty-six structural schemes from which in the paper are presented four of them.

Further on we present theoretical and experimental researches concerning the dynamic and cinematic modeling of the elastic and safety clutches with flat translation followers.

In the end there are presented some advantages of the new type of clutch, "Elastic and safety clutch" [4].

### **2. THE SYSTEMATIZATION AND THE TOPOLOGICAL ENGENDERING OF THE CLUTCHES**

Starting from the general definition of the mechanical clutches and taking in consideration the constructive and functional variety of them, systematization criterions and sub-criterions can be identified and formulated, centralized in figure 1, [3], [4]. The topological variants, obtained from the conditions of the proposed criterions, are marked in table with bold character. In the end, it is obtained matrix representation similar to the table of Mendeleev. For each topological variant that had been obtained, there are specified some meaningful examples of known – in the specialty literature – clutches, [1].

In the realized topological synthesis (table 1), there were identified new topological variants and there were found out all the main topological variants known – until now.

The paper objective is the new variant, III 20, [4]. From the III 20, topological variant, it can be derivate meaningful structural schemes, with a method proposed by the authors. Among the most representative clutches belonging to the topological synthesis from table 1, are the following:

- **I 2** Permanent fix clutches without the deviations taking over (the clutch with sleeve);
- **I 14** Permanent elastic clutches with the axial deviations processing (type Forst);
- **I 20** Permanent elastic clutches with the combined deviations taking over (Voith-Moreau clutch);
- **I 24** Permanent rigid clutches with the axial deviations taking over (with guiding);
- **I 26** Permanent rigid clutches with the radial deviations taking over (Schmid);
- **I 28** Permanent rigid clutches with the angular deviations taking over (cardanic clutch);
- **I 30** Permanent rigid clutches with the combined deviations taking over (sprocket clutch);
- **II 2** Intermittent fix clutches cogged with frontal radial teeth;
- **II 22** Intermittent rigid clutches with friction (with plan friction surface);
- **III 20 Elastic and safety clutch;**
- **III 22** Safety clutches (with breaking elements);
- **IV 30** Intermittent automated centrifugal clutches ( with sabots);
- **V 1** Plain-directional clutches.

### **3. THE ELASTIC AND SAFETY CLUTCH**

The paper presents a new type of clutch named “Elastic and Safety Clutch”, that can accomplish the functions of the elastic and those of the safety clutches, but that is not a combined clutch [3]. The angle of relative rotation between the two semi-clutches depends on the number of cam prominences. The strict systematisation of the extant clutches, as well the simple functions' combinations lead to new types of clutches.

Starting to the topological variant **III 20**, of the elastic and safety clutches further on there are tacked two important problems:

**a.** A proceeding proposal wide allows the derivation of the structural scheme frame the obtained topological variant (III 20);

**b.** The identification and the systematization, basic on the proposed proceeding, of the most representative and utilizable elastic and safety clutches structural.

The elastic and safety clutches are characterized thought the next functions (functional technique criterions):

- ◆ They make the bundle between two shafts (with relative fix variable position) and ensure the moment transmission and the rotation motion between the shafts (according to the general definition );
- ◆ The power transmission is braked off when the resistive moment outruns an imposed limit value; the energy flux braking off it is realized basis on an elastic element deformation.

From the analysis of the proprieties corresponding to the elastic and safety clutches, a distinct importance goes to the elastic element modelling, a thus as to ensure the every flux automated braking off, at the torque limit value.

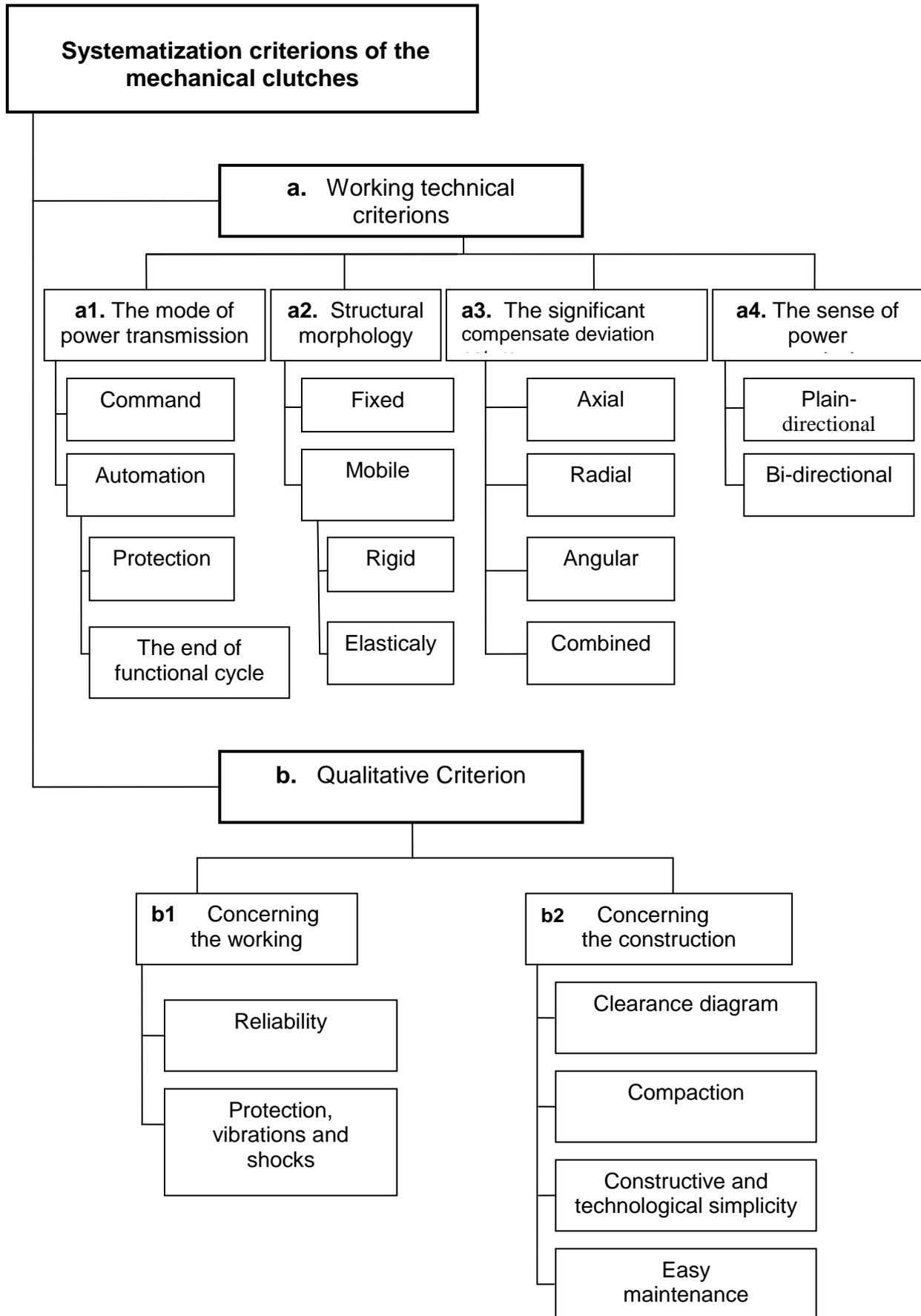
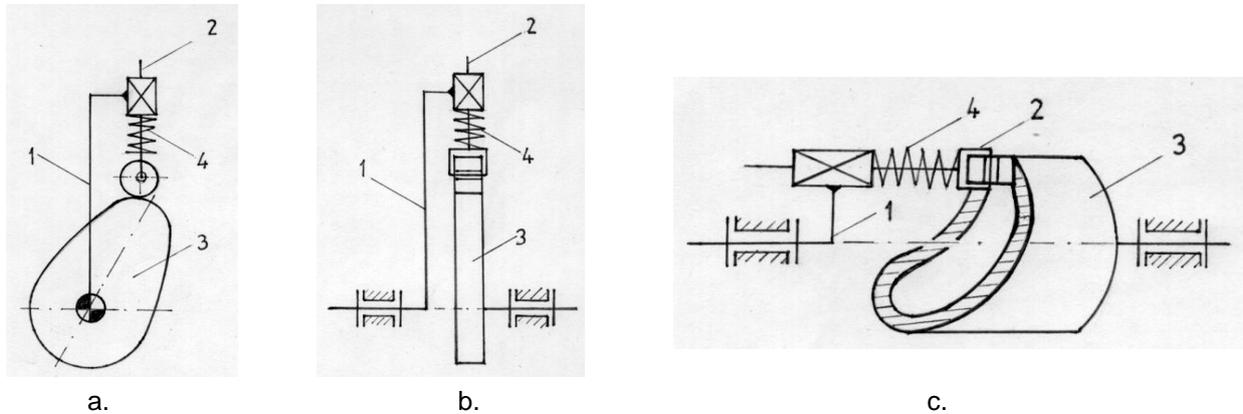


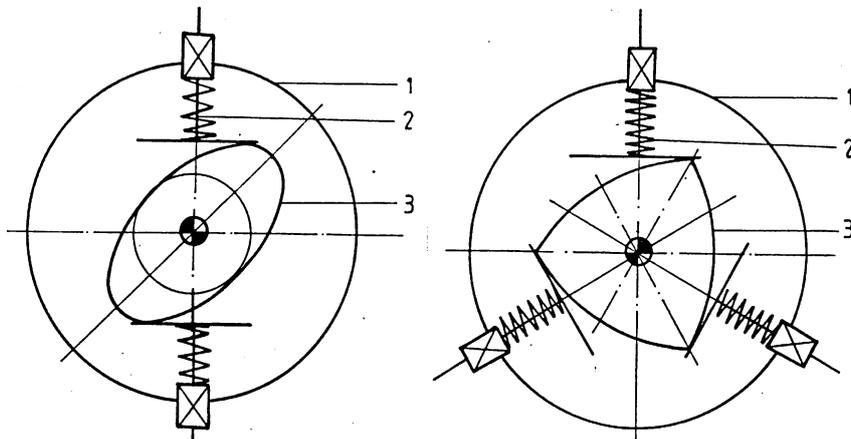
Fig. 1 Systematization criteria of the mechanical clutches



From the use in technique mechanisms critic analysis [2], it resulted that the cam mechanism (figure. 2 and figure 3) lends oneself (the best) to the demands previously formulated, thus:



**Fig. 2 Structural scheme**



**Fig. 3 Structural scheme of the elastic and safety clutch with flat translation followers**

#### 4. CONCLUSIONS

Starting from the general definition of the mechanical clutches and taking in consideration the constructive and functional variety of them, systematization criterions and sub-criterions can be identified and formulated. Basis on the established criterions, the topological engendering of mechanical clutches can start. The proposed engendering modality includes all the mechanical clutches representative variants, existent in the specialty literature.

It is presented a derivation proceeding of the structural schemes which leads to the obtaining of a new clutch variant named **“Elastic and safety clutch”**.

#### 5. References

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